

REVIEWS

Payne's Manual of Experimental Botany

This manual is conceived in an excellent spirit, and its purpose, as stated in the preface, is "to teach botany by experiment." The publisher's announcement describes it as "a laboratory manual for a complete high school course, in which botany is continually correlated with practical gardening, farming, and bacteriology." In this continuous correlation lies what the reviewer considers one of the main weaknesses of the book. Undoubtedly the movement to introduce the study of the principles of agriculture into secondary schools is a movement in the right direction, but why agricultural matter should be eternally mixed in with botany until the latter science loses all semblance of its real self, it is difficult to comprehend. To read (p. 45 et seq.) directions for a high school pupil, *as part of a course in experimental botany* (!) to "visit a farm," and "describe a plow" and tell how it is used; to investigate the economic problem of "why truck farms abound near cities"; to "visit a wheat field at harvest time and observe the process [what process is not stated] at each step"; to investigate "the way in which the various small fruits and vegetables are gathered and prepared for marketing"; to "visit a commission merchant's place of business *at any season*" and "make a list of the products *by season*" (*sic*); to describe the process of milling; to "visit a saw-mill and see how logs are reduced to various kinds of lumber"; to read this in what professes to be a text book of botany, leaves no room for doubt that it is high time to call a halt in the emasculation of high school botany. Let us teach agriculture, by all means, in the proper time and place, but let us not confuse and deceive the pupil by making him think that plowing and milling and market gardening are a part of the science of botany, any more than the daily work of the butcher has anything to do with the science of zoölogy.

To follow the author through the book requires several new adjustments of ideas. Thus the first exercise on page 49, to

* Payne, Frank Owen.—Manual of Experimental Botany, pp. 1-272, figs. 117. New York. American Book Company. 1912.

find out, by observation, the parts of a seed, can by no strain of words be called an experiment, and the wisdom of the author's plan, as stated in the Preface (p. 3), "to present the morphological part also in the form of experiments," may be regarded as questionable from a pedagogical standpoint, as tending to give the pupil a quite erroneous notion of what an experiment really is. To call seeds, water, leaves, *et cetera* "apparatus," seems really unfortunate, for the pupil will surely have to abandon this notion entirely if he continues scientific studies in more advanced grades. Incidentally, this material is omitted in the list of required apparatus on page 270.

On page 38 mineral nutrients are erroneously called "plant foods," and the definition on page 52, "An embryo is an immature or undeveloped plant or animal," would include boys and saplings. On page 58, in an experiment "*To find how to make the embryo plant begin to grow,*" the pupil is directed to plant seeds in sawdust in three tumblers, one of which is not watered, the second kept moist, and the third saturated by having the tumbler filled with water. The next direction is to place the tumblers where the seeds in all three will have the same amount of air (!) and heat. As the "conclusion," the pupil is directed to "state the effect of water on germination as shown by the experiment." The appended suggestion is for the pupil to visit a malt house and test the malt for starch and grape sugar, and then the question of water supply is again taken up. The "reference work" in connection with the subject of "heliotropism" (p. 101) is to "find out how beet sugar is obtained, tracing the process from seedtime to the manufactured product." On page 109 it is implied that the conclusion and the result of an experiment are synonymous. On pages 70-71, the heading of the work dealing with the retardation of growth by the removal of cotyledons from a germinating seed is "Effect of mutilation," though the pupil is led to question the true significance of his experiment in a "query"; so also in connection with root-hairs, on page 104. It is implied on page 78 that, owing to diminished water supply, desert plants are of small stature, thus ignoring the existence of such large desert plants as the giant cactus. But such in-

accuracies are too numerous to mention: *e. g.*, node for internode (probably) on page 112, growing point synonymous with plumule (p. 114), object of experiment stated quantitatively and the experiment carried through qualitatively (pp. 130-131), further experimentation assigned as "reference work" (p. 137), "leaves exert an upward pull"! (p. 151), the implication that government encouragement of tree planting in the western states is closely correlated with transpiration (p. 156), the implication that the release of oxygen in photosynthesis accounts for the greater "purity" of country air over city air (pp. 165-166), the definition of pollination as the reception of pollen *by the ovules* (p. 187), the implication that Jack-in-the-pulpit is the same as Skunk Cabbage (cf. "Jack-in-the-pulpit or Skunk Cabbage"—p. 206, with "Toadflax or Butter and Eggs"—p. 212), and so on.

On page 153, the old method of shielding a portion of a leaf from light by corks, long since shown to be fallacious by both King and Ganong, is retained, and the object of this experiment in starch-making is stated in the indefinite way, "To discover the effect of light upon foliage."

But there are also good points about the book. The device on page 59 for exposing germinating seeds to differential water supply, the experiment (p. 87) to show, by using eosin and methyl green, that the path of liquid up in a parsnip root is different from the path of the liquid down, and many of the illustrations—notably figures 47, 59, 98, and 115, are excellent.

The reviewer feels that it is unfortunate for the author and for high school pupils and teachers that the manuscript was not submitted by both author and publisher to some competent botanist or university teacher before being printed. As is usual with this publishing house, the date of publication is nowhere given, and the reviewer regards this as a serious defect, especially in a text book on any science. The press work and binding are excellent, but think of omitting an index in the year of our Lord one thousand nine hundred and twelve!

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